

PAPERS AND SHORT REPORTS

Delivery after caesarean section: review of 2176 consecutive cases

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Abstract

A total of 2176 consecutive patients who had had one previous caesarean section were studied retrospectively. A repeat elective caesarean section was performed in 395 (18.2%). Labour started spontaneously in 1363 patients, 301 of whom were given oxytocin to accelerate inert labour, and was induced by amniotomy and infusion of oxytocin in 418 women; 1618 of these 1781 patients (90.8%) delivered vaginally. Patients who had had a previous vaginal delivery were more likely to deliver vaginally again. Those women in whom the initial caesarean section had been performed during labour before the cervix was 4 cm dilated were less likely to deliver vaginally than those who had progressed further in labour or those who had had an elective caesarean section. Similarly, those who received oxytocin to stimulate inert labour were more likely to require a repeat caesarean section than those who did not. The uterine scar ruptured in only eight (0.45%) of the 1781 patients allowed into labour. The risk of rupture of the scar was not increased by the use of oxytocin alone either to induce or to accelerate labour. The combination of oxytocin to accelerate labour and epidural analgesia to provide pain relief, however, was associated with an increased incidence of scar rupture.

Labour may be safely allowed in women who have had a previous caesarean section, most of whom will deliver vaginally. Induction of labour does not increase the risk of either a repeat caesarean section or rupture of a uterine scar.

Introduction

The management of patients who have had a previous caesarean section continues to cause problems, though it is now widely accepted that vaginal delivery should be attempted unless the indication for the previous caesarean section recurs or the present pregnancy is complicated by another condition that warrants

delivery by caesarean section.¹ Dewhurst reported the risk of rupture of a classical caesarean section scar to be 2.2% for all cases, rising to 4.7% for those women who went into labour and to 8.9% for those delivered vaginally.² The corresponding figures for the lower segment operation were 0.5%, 0.8%, and 1.2%, respectively. He reported the maternal mortality associated with ruptured classical scars to be 5% with a fetal mortality of 73%; on the other hand, he recorded no deaths among 55 mothers with a ruptured lower segment scar, though the fetal mortality was 12.5%.

It has long been the practice in this hospital to allow patients who have had one previous lower segment caesarean section to go into labour in the absence of a recurrent indication for caesarean section or a new indication that precludes vaginal delivery. When these criteria are met vaginal delivery is anticipated and oxytocin used to induce or accelerate labour when necessary.

Patients and methods

During the six years 1979-84, 41 753 mothers delivered 42 278 babies in this hospital; of these, 2176 who had had one previous caesarean section delivered 2196 babies. The 2176 patients were managed as follows. (1) In 395 delivery was by repeat elective caesarean section. (2) Altogether 1363 women admitted in spontaneous labour had a forewater amniotomy followed in 301 cases by an oxytocin infusion as cervical dilatation was not progressing at a rate of 1 cm/h. The oxytocin was started at a rate of 6 mU/min and increased in increments of 6 mU/min to a maximum of 36 mU/min. When the response at this rate of infusion was inadequate the rate was sometimes increased further at the discretion of the attending obstetrician. (3) In 418 women labour was induced by amniotomy and the simultaneous start of an oxytocin infusion. (4) Continuous fetal heart monitoring was used in 982 of the 1781 patients who were allowed into labour; catheters to monitor intrauterine pressure were not used. (5) Epidural analgesia was administered to only 85 of the 1781 patients (4.8%).

All the case notes were studied retrospectively. Data were collected manually and then tabulated by computer; cross tabulations were analysed by the χ^2 statistic for general association or the Mantel-Haenszel χ^2 statistic linear association (trend) where appropriate.³ In the case of outcomes whose incidence was too low for the application of χ^2 tests 95% confidence intervals were calculated for the proportions by means of tables and formulas.⁴

Results

Table I summarises the outcome of the 2176 pregnancies; disproportion (105), breech presentation (50), unsuitability for induction (49), unstable lie (44), and intrauterine growth retardation (44) were the main indications for

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repeat elective caesarean section. When a patient who had previously had a caesarean section for disproportion was found to have an engaged cephalic presentation the original diagnosis was dismissed and vaginal delivery anticipated. Twenty eight patients who presented in early labour before the date of a planned elective caesarean section and were immediately delivered by caesarean section were included in the elective caesarean group as their outcome was no different in any respect.

TABLE I—Outcome in 2176 patients who had had one previous caesarean section

	No	Epidural analgesia	Rupture	Vaginal delivery	Caesarean section
Repeat elective caesarean section	395				395
Spontaneous labour; no augmentation	1062	15	2	984	78
Spontaneous labour with augmentation	301	30 (2)*	3	260	41
Induced labour	418	40 (2)*	3	374	44
Total	2176	85 (4)*	8	1618	558

* Figures in parentheses are numbers with rupture of scar.

Labour started spontaneously in 1363 women, of whom 301 required an infusion of oxytocin. Thirty of these 301 patients and 15 of those whose labours progressed normally needed epidural analgesia for pain relief. Of the 1363 women who went into spontaneous labour, 119 were delivered by caesarean section; they comprised 41 of the 301 in whom labour was accelerated and 78 of the 1062 in whom it was not ($\chi^2=10.01$; $df=1$; $p=0.002$). The uterine scar ruptured on only five occasions: two ruptures occurred among the 1062 women whose labours progressed normally; one among the 271 women whose labours were accelerated; and two among the 30 patients who received an oxytocin infusion to accelerate labour and were also given an epidural anaesthetic for pain relief. The 95% confidence intervals (table II) for the patients who were given both oxytocin and an epidural did not overlap those for the patients who required neither, indicating that there was a higher proportion of uterine scar ruptures among patients given both agents ($p<0.05$).

TABLE II—Incidence of uterine rupture in different clinical groups, with 95% confidence intervals

Labour	Total No	No (%) with rupture	95% Confidence interval (%)
Spontaneous; no oxytocin or epidural analgesia	1047	2 (0.2)	0.024 to 0.708
Spontaneous with epidural analgesia; no oxytocin	15		0.0 to 21.8
Spontaneous with oxytocin; no epidural analgesia	271	1 (0.4)	0.01 to 2.06
Spontaneous with oxytocin and epidural analgesia	30	2 (6.7)	0.82 to 22.07
Induced; no epidural analgesia	378	1 (0.3)	0.01 to 1.44
Induced with epidural analgesia	40	2 (5.0)	0.61 to 16.9

Labour was induced in 418 (23.5) of the 1781 patients in whom vaginal delivery was expected; 374 delivered vaginally and 44 required an emergency caesarean section. This incidence of emergency caesarean section was no different from that found among the women who started labour spontaneously ($\chi^2=1.035$; $df=1$; $p=0.309$). The uterine scar ruptured on

TABLE III—Gestational age and birth weight related to emergency caesarean section in the 1781 patients allowed into labour. Figures are numbers (%) of patients

	All patients	Vaginal delivery	Caesarean section
Gestation (weeks)*:			
<37	71 (4.0)	63 (88.7)	8 (11.3)
37-40	706 (39.6)	639 (90.5)	67 (9.5)
40+	1004 (56.4)	916 (91.2)	88 (8.8)
Birth weight (g)†:			
<2500	88 (4.9)	77 (87.5)	11 (12.5)
2500-2999	211 (11.8)	194 (91.9)	17 (8.1)
3000-3499	549 (30.8)	498 (90.7)	51 (9.3)
3500-3999	646 (36.3)	586 (90.7)	60 (9.3)
4000+	287 (16.1)	263 (91.6)	24 (8.4)

* Mantel-Haenszel χ^2 for trend=0.596; $df=1$; $p=0.440$.

† Mantel-Haenszel χ^2 for trend=0.320; $df=1$; $p=0.572$.

three occasions: two ruptures occurred among the 40 women who needed an epidural and one among the 378 women who did not; this difference was not significant (table II). The fetal heart rate was monitored continuously in 982 of the 1781 patients, including the eight women whose scar ruptured.

Table III shows the incidence of emergency caesarean section in relation to gestational age and birth weight. The largest baby delivered vaginally

TABLE IV—Relation between cervical dilatation at time of previous caesarean section and incidence of emergency caesarean section. Figures are numbers (%) of women

	All patients	Emergency caesarean section
Elective caesarean section	574 (32.2)	44 (7.7)
Cervical dilatation*:		
<4 cm	226 (12.7)	30 (13.3)
4-9 cm	916 (51.4)	84 (9.2)
Fully dilated	65 (3.6)	5 (7.7)
Total	1781 (100)	163 (9.2)

Overall $\chi^2=6.411$; $df=3$; $p=0.097$.

* <4 cm v all others: $\chi^2=5.29$; $df=1$; $p=0.021$.

TABLE V—Relation between previous vaginal delivery and incidence of emergency caesarean section. Figures are numbers (%) of women

Vaginal delivery*	All patients	Emergency caesarean section
None	672 (37.7)	100 (14.9)
Before previous caesarean section	342 (19.2)	32 (9.4)
After previous caesarean section	527 (29.6)	19 (3.6)
Before and after previous caesarean section	240 (13.5)	12 (5.0)
Total	1781 (100)	163 (9.2)

* None v all others: $\chi^2=42.598$; $df=1$; $p<0.001$.

TABLE VI—Management of delivery after previous caesarean section reported previously

Reference	Year	Total No of patients	No (%) who had elective caesarean section	Total No (%) who had caesarean section	No (%) who had vaginal delivery
Lawrence ²⁰	1953	849	43	77	33
Allahbadia ²¹	1963	565	45	47	53
McGarry ²²	1969	415	20	42	58
Morewood <i>et al</i> ²³	1973	423	43	59	41
Saldana <i>et al</i> ²⁴	1979	226	46	75	25
Gibbs ¹³	1980	1558	24	52	48
Meier and Porroco ⁹	1982	269	23	35	65
Jarrell <i>et al</i> ²⁵	1985	779	73	82	18
Current series		2176	18	26	74

weighed 5360 g. No relation was found between either gestational age or birth weight and the incidence of emergency caesarean section. In analysing the possible predictive factors for delivery by emergency caesarean section particular attention was paid to the cervical dilatation at the time of the previous caesarean section (table IV) and whether the patient had previously achieved a vaginal delivery (table V). Patients who had not attained a cervical dilatation of 4 cm at the time of the previous caesarean section were less likely to achieve a vaginal delivery than any other group, even those who had previously had an elective caesarean section ($p=0.021$). Furthermore, patients who had previously delivered vaginally either before or after the original caesarean section had a significantly lower rate of emergency section than those who had not had a previous vaginal delivery ($p<0.001$).

Only one intrapartum fetal death occurred among the 1781 women who were allowed into labour. This death was associated with rupture of the scar in a 38 year old gravida 7 who had had two previous vaginal deliveries after caesarean section for placenta praevia; she had started labour spontaneously and had not been given oxytocin or an epidural anaesthetic. One of the seven babies who survived uterine scar rupture developed severe cerebral palsy and died at 9 months; the others were developmentally normal at follow up.

Discussion

The 18% incidence of repeat elective caesarean section and the 9% incidence of emergency caesarean section reported here among 2176 patients who had had one previous caesarean section were lower than those recorded in any previous series of over 200 such cases (table VI). When a patient was adjudged suitable for vaginal delivery she was managed as a normal multiparous woman. Specifically, labour was induced if indicated and spontaneous labour was accelerated with oxytocin if necessary. In their review of labour after caesarean section Lavin *et al* concluded that "properly conducted vaginal deliveries after caesarean section are relatively safe, with a 0.7% incidence of uterine rupture."¹ We believe that the results of the present series vindicate our management: the incidence of caesarean section was lower than that recorded in other series and the incidence of rupture of a uterine scar (0.45%) was not significantly different from that cited by Lavin *et al*.²

Several authors have reported on the use of oxytocin either to augment or to induce labour. Both Lawlor *et al* and Donnelly and Franzoni concluded that giving oxytocin to such subjects was contraindicated.^{5,6} Browne and McGrath, however, recorded 55 cases without complication,⁷ and Paul *et al*, reporting on 289 patients (32 inductions and 257 augmentations), found no significant difference in the incidence of rupture of a scar in these women.⁸ Meier and Porroco, who used oxytocin to augment or induce labour in 20% of their patients, achieved a rate of vaginal delivery of 65% and noted only one scar rupture among 207 patients.⁹ Horenstein *et al* noted three ruptures among 58 patients who were given oxytocin (maximum dose 22 mU/min) compared with three ruptures among 234 women who were not.¹⁰ Though the difference was not significant, they concluded, on reviewing previous reports, that scar rupture was more likely if oxytocin was administered. In this study no significant increase in scar rupture was noted when oxytocin was used alone either to augment or to induce labour. Although patients who needed oxytocin to accelerate inert labour had a higher incidence of emergency caesarean section than those who did not, the supervised use of oxytocin to stimulate inert labour enabled 90% of patients allowed into labour to achieve a safe, uncomplicated vaginal delivery.

The use of epidural analgesia in patients who have had a previous caesarean section remains controversial. Meehan *et al* first reported the use of regional block analgesia in labour among such patients and concluded that it was safe even though they recorded two scar ruptures among 71 cases.¹¹ More recently Meier and Porroco and Nielsen *et al* gave epidural anaesthetics to 11% and 29% of their patients without complication.^{9,12} Gibbs, on the other hand, thought that epidural analgesia was specifically contraindicated because of its ability to mask pain caused by uterine rupture.¹³ Only 85 patients included in our series received epidural analgesia for pain relief, but four of the eight uterine ruptures occurred among these 85 women, and a significant increase in rupture was noted among the women who started labour spontaneously and were given both an oxytocin infusion to accelerate labour and an epidural anaesthetic for pain relief. In these patients uterine contractions may have been hyperstimulated even though they were being monitored continuously by external manometer, and the use of internal uterine catheters might have reduced the incidence of scar rupture.^{9,14} Clearly great caution must be exercised before considering the combination of oxytocin infusion and epidural analgesia in such subjects. On the other hand, the patients who needed this form of management would, otherwise, have been delivered by emergency caesarean section.

Dewhurst emphasised the usefulness of lower abdominal pain and tenderness as symptoms leading to the early detection of uterine rupture,² though others found this an unreliable feature¹⁵⁻¹⁷ and Case *et al* in a review of 20 repeat caesarean sections performed because of severe lower abdominal pain found only one uterine rupture.¹⁸ None of the eight uterine ruptures in our series was preceded by lower abdominal pain, but abnormalities in the fetal heart rate were noted on cardiotocography in every case. We reiterate the recommendation of Flamm *et al* that continuous cardiotocography should be

used in all patients who have had a previous caesarean section, particularly when they are given an oxytocin infusion and epidural analgesia.¹⁴

It has been reported that patients with a history of vaginal delivery after caesarean section are more likely to deliver vaginally again.^{17,19,20} In our study patients who had delivered vaginally either before or after the initial caesarean section had a lower incidence of emergency caesarean section than those who had not ($p=0.001$). The incidence of repeat caesarean section was significantly increased ($p=0.021$) if the initial caesarean section had been performed in labour before the cervix was 4 cm dilated. This was probably due to recurrent cervical dystocia, and it is difficult to see how the repeat caesarean section rate could have been reduced among this group of subjects.

The incidence of intrapartum fetal death (one in 1781) recorded among this potentially high risk group of patients was low and no different from that recorded among other patients in the hospital during the study period.

These results clearly show that once the small number of patients who require an elective caesarean section have been excluded labour may safely be permitted in women who have had one previous caesarean section, and most (90.8% in our series) will deliver vaginally. They also show that induction of labour, in the manner described, does not increase the risk of repeat caesarean section or uterine rupture. Though they show that oxytocin may be administered to augment inefficient labour, the combined use of oxytocin to accelerate labour and epidural analgesia to provide pain relief significantly increases the risk of uterine rupture.

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